REMARKS

Claims 9, 16, 17, 18, 20 and 21 are amended herewith and new claims 22-26 have been added to the application to round out the scope of claims. Accordingly, claims 9-26 are now pending in the application.

Claims 9, 15, 18 and 20 stand rejected under 35 U.S.C. § 102 (e) as being anticipated by United States patent number 5,892,541 to Merrill (Merrill).

The present invention relates to a photosensor with mixed analog and digital signal integration. Claim 9 recites:

> An imaging system, comprising: an active pixel image sensor array disposed on a substrate, said array comprising a plurality of pixels; at least one analog to digital converter for sampling and converting analog information from pixels in said array to digital values; and a plurality of digital memory arrays disposed on said substrate for storing and accumulating said digital values; wherein each pixel in said active pixel image sensor array is sampled multiple times during an integration period and each sampled value is stored in at least one of said digital memory arrays. (Emphasis added).

Merrill relates to a method for increasing the dynamic range of an array of active pixel sensor cells. According to Merrill "each time a cell is read, the number of photons collected by the cell is saved and the cell is reset if the cell would normally saturate by the end of the integration period." Abstract.

Merrill does not, however, teach or suggest the unique combination of limitations recited in claim 9 including "a plurality of digital memory arrays disposed on... [a] substrate for storing and accumulating said digital values." Accordingly, Merrill does not anticipate claim 9 or render it obvious, and the rejection of claim 9 under 35 U.S.C. § 102 (e) over Merrill is overcome.

Claim 15 depends directly from claim 9 and incorporates every limitation thereof. Accordingly, the rejection of claim 15 under 35 U.S.C. § 102 (e) over Merrill is overcome for at least the reasons given above in relation to claim 9.

Claim 18 recites a unique combination of limitations, including "sampling and converting... analog image information for a first pixel of ... [an] active pixel image sensor array a plurality of times during a desired integration period to produce a first plurality of digital values; storing said first plurality of digital values in a first digital memory...sampling and converting said analog image information for a second pixel of said active pixel image sensor array a plurality of times during a desired integration period to produce a second plurality of digital values; and storing said second plurality of digital values in a second digital memory," (emphasis added). There is nothing in Merrill to teach or suggest a first digital memory and a second digital memory. Accordingly, the rejection of claim 18 under 35 U.S.C. § 102 (e) over Merrill is overcome.

Claim 20 depends directly from claim 18 and incorporates every limitation thereof. Accordingly, the rejection of claim 20 under 35 U.S.C. § 102 (e) over Merrill is overcome for at least the reasons given above in relation to claim 18.

Claims 10 and 19 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Merrill in view of United States patent number 6,583,817 to Sywe N. Lee (S. Lee).

In relation to claim 10, Applicant notes that the S. Lee reference relates to auto calibration of an analog to digital converter within a CMOS type image sensor. The reference discusses an analog to digital (A/D) converter connected to each column line. "Among other methods, the A/D converter may be formed by a high gain comparator, and 8-bit binary counter coordinated with a reference ramp signal synchronized in a specific timing sequence." Column 2, lines 7-11.

Without conceding that the proposed combination is properly made, Applicant submits that the Merrill and S. Lee references, whether taken alone or in combination, do not teach or suggest every limitation of claim 9, from which claim 10 depends. For example, Merrill and S. Lee do not teach or suggest "a plurality of memory arrays for storing and accumulating... digital values." Accordingly, the proposed combination of Merrill and S. Lee references does not anticipate claim 10 or render it obvious, and the rejection of claim 10 under 35 U.S.C. § 103 (a) is overcome.

Claim 19 depends from claim 18, and incorporates every limitation thereof. The Office Action acknowledges that Merrill does not teach or suggest the claim 19 limitation of a digital memory cell fabricated in CMOS. However, the proposed combination of Merrill and S. Lee references also does not teach or suggest the claim 18 limitations of "a first digital memory... and... a second digital memory." Accordingly, the proposed combination of Merrill and S. Lee does not anticipate claim 19, or render it obvious.

Claim 11 stands rejected under 35 U.S.C. § 103 (a) as being unpatentable over Merrill in view of United States patent number 5,248,971 to Mandl (Mandl). The Office Action acknowledges that Merrill does not teach or suggest the claim 11 limitation of an oversampling converter. Accepting, *arguendo*, that the proposed combination of references is properly made, Applicant notes that claim 11 depends from claim 9 and therefore includes the claim 9 limitations of "a plurality of digital memory arrays." Merrill and Mandl, whether taken alone or in combination, do not teach or suggest this combination of limitations. Therefore, the rejection of claim 11 under 35 U.S.C. § 103 (a) over Merrill in view of Mandl is also overcome.

Claims 12-14 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Merrill in view of United States patent number 6,466,265 to Paul P. Lee (P. Lee).

The Office Action acknowledges that Merrill does not teach or suggest an analog signal processor including analog double sampling circuitry. The combination of Merrill and the Lee is proposed in an effort to overcome this deficiency. Accepting, *arguendo*, that the proposed combination of references is properly made, Applicant notes that claims 12-14 each depends, directly or indirectly, from claim 9 and incorporates every limitation thereof. The proposed combination, however, does not teach the claim 9 limitations of "a plurality of digital memory arrays." Accordingly, the rejection of claims 12-14 under 35 U.S.C. § 103 (a) over Merrill in view of P. Lee is also overcome.

Claims 16 and 17 stand rejected under 35 U.S.C. § 103 (a) over Merrill. The Office Action acknowledges that Merrill does not teach "a digital signal processor between detection circuits... and memory unit," and takes official notice that "digital signal processing is commonly performed on pixel data before it is stored in memory," in an attempt to overcome this deficiency. While such processing may or may not be known, the official notice does not address the particular claim 9 limitations including "a plurality of digital memory arrays disposed on [a] substrate for storing and accumulating said digital values." Therefore, even in light of the official notice taken, the Merrill reference does not teach of suggest every limitation of claim 9. Inasmuch as claims 16 and 17 depend directly and indirectly from claim 9, the rejections of claims 16 and 17 under 35 U.S.C. § 103 (a) over Merrill, in view of official notice taken, are overcome.

Claim 21 stands rejected under 35 U.S.C. § 103 (a) over Merrill in view of United States patent number 5,665,959 to Fossum et al. (Fossum).

The Office Action acknowledges that Merrill does not teach or suggest the components being on a substrate. The combination of Merrill and Fossum is proposed in an effort to overcome this deficiency. Fossum, however does not show "a substrate comprising: an active pixel image sensor array comprising a plurality of pixels...and a

plurality of digital memory arrays for storing and accumulating... digital values." To the contrary, Fossum teaches directly away from the claimed invention. Even if the "storage" shown in figure 7 were assumed to be a "memory array," figure 7 clearly shows that "storage" receives "data out." Therefore, one of skill in the art would understand that "storage is not" part of the substrate. This understanding is reinforced in the light of figures 1a and 1b, which show serial output taken off of "a substrate 11." Column 5, line 34. Accordingly, even accepting, *arguendo*, the propriety of the proposed combination, Merrill and Fossum, whether taken alone or in combination, do not teach or suggest all of the limitations of claim 21. Therefore, the rejection of claim 21 under 35 U.S.C. § 103 (a) over Merrill in view of Fossum is overcome.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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